

# TECHNICAL NEWS BULLETIN

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### ATTRACTION BETWEEN COILS IN THE RAYLEIGH CURRENT BALANCE

The current balance, used in the absolute determination of the ampere, in its ideal form would consist of two coaxial circular turns of infinitely thin wire carrying an electric current, and thereby attracting each other with a measurable force. If the circles are properly spaced, the force has a maximum value. This value was computed years ago in terms of the ratio of the radii of the circles, so that if the circles are moved by trial into the position of maximum force and this force is then measured, it is possible to check this value by computations, if only the ratio of radii and the currents are known. Or what amounts to the same thing, this gives an absolute measure of the electric current.

An actual current balance must have wires of some thickness to avoid overheating by the current, and in fact a single pair of circles will not give a sufficiently large force to be measured with precision. Hence there are 2 coils, each having 100 or so turns of

wire. This departure from the ideal, while it makes possible the precise measurement of the force, renders computation more complicated.

In the earlier determinations of the ampere at the Bureau, the computation was made by regarding each coil as composed of eight suitably placed ideal circular filaments and then computing the force between each of the resulting pairs of filaments. In recent repetitions of those determinations, the experimenters have been glad to accept the earlier computations when using the same pairs of coils as originally used, so that only the experimental part of the determination was actually repeated. However, when it was desired to use a pair of coils for which the force had not been computed, it seemed worth while to develop a systematic formula with more definite statements as to its degree of validity, by which the force could be more readily computed in new cases, and which would furnish an independent check upon the older computations. This has been done, and will be published as Research

Paper No. 615 in the November number of the Bureau of Standards Journal of Research.

#### SPECTRAL DIFFERENTIATION OF PURE HYDROCARBONS

The spectra of 36 hydrocarbons have been recorded in the near infrared between wave numbers 5,500 and 9,000, using an automatic recording infrared glass spectrograph. Specific absorptive indices have been calculated from the results and plotted against wave numbers. Correlations of the spectra of the various compounds have been made in regions associated with three energy transitions in the molecules. Characteristic differentiation of the compounds according to structural types has been indicated. Research Paper No. 610 in the November number of the Bureau of Standards Journal of Research should be consulted for a complete report of this study.

#### ISOLATION OF MESITYLENE, PSEUDOCUMENE, AND HEMIMELLITENE FROM AN OKLAHOMA PETROLEUM

Research Paper No. 614 in the November number of the Bureau of Standards Journal of Research reports the isolation, in a very pure condition, of mesitylene, pseudocumene, and hemimellitene from a mid-continent petroleum. This was accomplished by extracting with liquid sulphur dioxide the fraction distilling from 118° to 132° C. at 215 mm. and fractionally distilling and crystallizing the extract. Selective sulphonation and crystallization of the sulphonic acids and their hydrolysis have also been employed. The boiling points, freezing points, refractive indices, densities, and infrared absorption spectra of these hydrocarbons have been measured. Mesitylene was found to have 2 crystalline modifications melting at -44.78° and -51.74° C., respectively.

The content of pseudocumene and hemimellitene in the crude petroleum was about 0.2 and 0.06 percent, respectively. The amount of mesitylene in the fraction extracted was about 0.02 percent of the crude. More mesitylene, however, may be expected in the lower boiling fractions.

#### SPECIFIC VOLUMES OF SATURATED VAPORS

For low pressures, approximate values of the specific volume of sat-

urated vapors may be calculated from the well known Boyle's law. This law states that the product of the volume which a gas occupies multiplied by the pressure is equal to the product of a constant multiplied by the absolute temperature. Both superheated and saturated vapors deviate considerably from this law, however. As the pressure is increased, the product of the specific volume of the saturated vapor multiplied by the pressure becomes less than the value calculated from Boyle's law, and for a pressure one fourth of the critical pressure the difference may be as much as 25 percent. Numerous more accurate equations have been devised for representing the specific volume of gases and vapors in terms of the pressure and temperature, but accuracy is gained usually by the addition of several arbitrary constants, which increase the labor involved in making calculations.

The usual procedure is to calculate the volume of the saturated vapor by substituting the appropriate pressure and corresponding saturation temperature in the more general equation for the superheated vapor. In Research Paper No. 616, in the November number of the Bureau of Standards Journal of Research, the procedure has been reversed. A formula is given which expresses a relation between the volume of the saturated vapor, the vapor pressure, the critical pressure, and the density of the liquid.

Besides the gas constant in Boyle's law, this formula contains two empirical constants. One of these is, for all substances tried, so nearly equal to 2.72 that the number may be considered as universal. Values calculated from this formula agree with the experimental values for the pressures up to one fourth of the critical pressure and differ by only a few percent for pressures between one fourth and one half the critical.

A general equation expressing a relation between pressure, volume, and temperature for superheated vapors is derived from an approximation to this formula, and the assumption that for any given temperature the product of pressure multiplied by volume is less than that indicated by Boyle's law by an amount which is proportional to the density of the vapor. This general formula contains the same empirical constants that occur in the formula for the saturated vapor.

This equation for superheated vapor is recommended only for temperatures

below the saturation temperature corresponding to 0.1 the critical pressure, but considering that there are only 2 empirical constants, the equation represents the experimental data remarkably well in this limited region.

#### STABILITY OF LEVULOSE IN AQUEOUS SOLUTIONS OF VARYING ACIDITY

Levulose, a sugar of wide occurrence in sirups, honey, and similar commercial products, can be produced inexpensively from natural sources by a process previously devised by the Bureau. In the steps of this process the sugar is necessarily subjected to the action of acids and alkalis, with resulting small losses which hitherto could not be evaluated.

Pure levulose was treated with acids of strengths ranging from pure water to concentrated hydrochloric acid, and alkalis from water to twice normal sodium hydroxide. The temperature was varied between 4° and 100° C. The changes were studied particularly in the early stages of the reaction.

In strong acid solutions levulose undergoes a dehydration to form anhydro sugars of negative rotatory powers. In alkaline solutions it is partially transformed to dextrose and mannose. In the intermediate ranges both reactions occur. The rates of these transformations were measured quantitatively at systematically varying acidity and alkalinity, these latter being expressed as pH. The data showed that levulose is most stable in solutions of pH 3.3. In other words, it is far more stable in slightly acid solution than in neutral solutions. The rates of change of these reactions with increase of temperature are relatively high.

The results of the investigation are reported in full in Research Paper No. 611 in the November issue of the Bureau of Standards Journal of Research. They are comprehensively summarized in a table in which the time required for a 1-percent decomposition of levulose is given for integral values of pH and 10-degree intervals of temperature. At 20°C. and pH 3 this time is 24 years; at 100°, 5 hours; at 20°C. and pH -2 it is 9 minutes; and at 20°C. and pH 13 it is 15 minutes. These extraordinary variations with pH show the necessity of careful pH control when working with levulose.

#### PREPARATION AND PROPERTIES OF ALDONIC ACIDS AND THEIR LACTONES AND BASIC CALCIUM SALTS

In Research Paper No. 613, which will be published in the November number of the Bureau of Standards Journal of Research, directions are given for the preparation of the crystalline acids and lactones derived from gluconic, mannonic, galactonic, xylonic, arabonic, and rhammonic acids. The compositions of the basic calcium salts of mannonic, galactonic, xylonic, arabonic, rhammonic, lactobionic, and maltobionic acids are reported, and their use for the purification of sugar acids is described. The utility of dioxane as a solvent in preparing the free sugar acids and their lactones is emphasized. The method of preparing gluconic acid by crystallization from water is suitable for the manufacture of that acid in large quantity.

#### A SEDIMENTATION METHOD FOR THE DETERMINATION OF THE PARTICLE SIZE OF FINELY DIVIDED MATERIAL SUCH AS HYDRATED LIME

Particle-size measurements of finely divided materials have recently been given much consideration by manufacturers and users of such products as hydrated lime, portland cement, paint pigments, fillers, etc. Some methods of determining particle size depend upon the microscope either to make all the measurements or to calibrate another method. In order to attempt to calibrate a sedimentation apparatus proposed for use in measuring the particle size of hydrated limes, some glass spherules were prepared because their shape made microscopic measurements more reliable. These spherules were separated into fractions having a range of a few microns. In making microscopic measurements of such materials it is necessary to cover the particles with a liquid. Measurements on glass spherules, ranging in size from about 2 to 10 microns, showed that the apparent diameter changed with change in index of refraction of the mounting medium. Thus, a filar micrometer eyepiece indicated a certain spherule had a diameter of 3.8 microns when measured in a liquid having a refractive index of 1.68 but had a diameter of 4.5 microns when immersed in a liquid having a refractive index of 1.33. Because of the effect produced by the mounting medium the true par-

ticle size could not be determined with the microscope, but there did exist a fair correlation between the sedimentation method and certain of the microscopic measurements.

A more complete account of this work will be published in the Bureau of Standards Journal of Research, probably in the January or February issue. This will include not only a comparison of the microscopic and sedimentation method for determining particle size, but also a description of the automatic recording balance and the particle size distribution of certain commercial hydrated limes.

#### OPTICAL AND CRYSTALLOGRAPHIC PROPERTIES OF ALKALI ZINC URANYL ACETATES

In the quantitative determination of sodium by the zinc uranyl acetate method it has been found (Barber and Kolthoff, Jour. Amer. Chem. Soc., vol. 50, p. 1625, 1928) that lithium, when present, is precipitated with the sodium salt and that potassium is only precipitated when present in relatively large amounts. The crystallographic and optical properties of the sodium, lithium, and potassium zinc uranyl acetates were investigated to determine what the relations of these salts were and whether they could be distinguished by a microscopic method. The lithium and the sodium zinc uranyl acetates occur as prismatic monoclinic crystals elongated in the direction of the crystallographic *b* axis. The sodium salt rarely, and the lithium salt almost never, occurs as individual crystals. Generally, beautiful cyclic pseudo-rhombohedral twins are formed. Both salts are biaxial positive with a large optic axial angle (approximately  $75^\circ$ ) and with the vibration direction gamma parallel to the crystallographic *b* axis. For the sodium salt ( $\text{UO}_2$ ),  $\text{ZnNa}(\text{CH}_3\text{COO})_6 \cdot 6\text{H}_2\text{O}$  the indices of refraction (for sodium light) are:

$\alpha=1.475 \pm 0.002$ ,  $\gamma=1.480 \pm 0.002$ ; and for the corresponding lithium salt,  $\alpha=1.495 \pm 0.002$ ,  $\gamma=1.503 \pm 0.002$ . X-ray powder diffraction patterns show that the lithium and zinc salts have identical crystal structures with somewhat different interplanar spacings and that they are therefore isomorphous. The potassium zinc uranyl acetate occurs as well developed holohedral tetragonal crystals with simple prismatic faces surmounted by first and second order pyramids. The indices of re-

fraction (for sodium light) are  $\epsilon=1.487$ ,  $\omega=1.477$ . The X-ray powder diffraction pattern is quite dissimilar from those of the lithium and sodium salts.

#### EFFECT OF JACKET-WATER TEMPERATURE OF ENGINE PERFORMANCE

Several investigators have studied the effect of high jacket temperature on the performance of liquid-cooled aircraft engines at sea level. To obtain data on the effect of changes in jacket temperature at various altitudes, preliminary tests have been made with a Curtiss D-12 engine in the altitude laboratory at the Bureau of Standards. The engine was operated at a constant speed of 2,000 r.p.m. under conditions corresponding to sea level, 10,000, and 20,000 ft. altitude. Under each condition, the jacket-water outlet temperature was varied from about  $30^\circ$  to  $95^\circ\text{C}$ . The results of these tests show that friction decreases and fuel economy increases at all altitudes as the jacket-water temperature is increased. At sea level and at low altitudes the power output decreases with increasing jacket-water temperature. However, at altitudes above about 9,000 ft. the power output improves as the jacket-water temperature is increased.

A further study of the effect of cylinder-wall temperature on engine performance at altitude is desirable, not only for estimating the advantages of high-temperature liquid cooling but also for evaluating the effect of cooling-air temperature on the performance of air-cooled aircraft engines.

#### EXTREME-PRESSURE LUBRICANTS

The use of extreme pressure lubricants has opened up a new field in industrial lubrication. Metallurgical research during the past 25 years has resulted in the development of alloy steels capable of withstanding high pressures when used in power-transmitting and load-carrying devices. Until recently, lubricants have not been available which would permit taking advantage of these metallurgical developments. Use of mineral oils as lubricants is about on a par with the use of cast iron in gears, so far as load-carrying capacity is concerned. Under conditions of high rubbing speed and high lubricant temperature, mineral oils may stand pressures as high as 10,000 to 20,000 lbs./in.<sup>2</sup>, whereas gears made from some of the

alloy steels will stand as high as 100,000 lbs./in<sup>2</sup>. The difference is indicative of what may be accomplished by the development of lubricants capable of withstanding high pressures. With such lubricants 5 to 10 times as much power may be transmitted without increase in the size of gearing, or conversely, for the same power transmission, the size of gearing may be reduced to one fifth or one tenth of that generally used at present in industrial equipment. That it is possible to develop lubricants for operation under these conditions is evidenced by the fact that lubricants recently tested at the Bureau will withstand computed pressures as high as 150,000 lbs./in<sup>2</sup> under severe test conditions without seizure of the metal surfaces.

The recent adoption of hypoid gears in the differentials of many automobiles made imperative the development of satisfactory extreme-pressure lubricants. Their success in this field has resulted in the rapid adoption of extreme-pressure lubricants for industrial lubrication, with marked success in many cases. However, the problems involved are very difficult to solve at present because of lack of recognized standards. Realizing the absolute necessity for such standards, almost 2 years ago, the lubricants research subcommittee of the Society of Automotive Engineers requested the Bureau to undertake a cooperative investigation leading to the establishment of significant test methods. As the problem is general in nature, the results are applicable to industrial as well as automotive lubrication.

As recorded in Technical News Bulletin No. 197 (September 1933), considerable progress has been made in this investigation, particularly in the development of a testing machine which gives in a few minutes information on extreme-pressure lubricants which could otherwise only be obtained after thousands of miles of car operation. Test methods and apparatus for all of the significant properties of these lubricants are rapidly being developed. When this stage has been reached and when permissible limits for the various properties have been determined, effective and satisfactory utilization of extreme-pressure lubricants will be possible.

#### FORCE OF SIDE WINDS ON AUTOMOBILES

When an automobile is driven along a level road the power developed by

the engine is used partly for overcoming mechanical and tire friction and partly in overcoming air resistance. For car speeds (in still air) in the neighborhood of 40 miles per hour, about one half the power developed by the engine is expended in overcoming air resistance. At higher car speeds the power required to overcome air resistance is in excess of the power required to overcome mechanical and tire losses. These relations, however, have been determined generally for still air or when the car is moving into "head-on" winds. Measurements made on model automobiles in one of the Bureau's wind tunnels show that if the wind blows from the forward quarter, at an angle to the fore and aft axis of the moving car, large side forces are introduced which tend to push the car sidewise across the road. These side forces, or lateral forces, are generally greater than the forces along the axis of the car, the longitudinal forces. For example, if the car is moving with a speed of 60 miles per hour with a 30 mile per hour horizontal wind blowing 90 degrees to the direction of motion the lateral force is about 300 pounds.

#### TESTS ON A REINFORCED-CONCRETE ARCH OF THE ARLINGTON MEMORIAL BRIDGE

The Bureau cooperated with the Arlington Memorial Bridge Commission in an investigation of the structural behavior of one of the reinforced-concrete arch spans of the Arlington Memorial Bridge at Washington, D.C. Data were obtained on the changes in temperature of the concrete, the coefficient of thermal expansion of the arch, the deflections and deformations of the arch, and the movements of the piers and of the expansion joints.

Temperatures in the concrete were determined with thermocouples and resistance thermometers. The rotations and deflections of the arch barrel were measured by means of clinometers on a continuous line of stations extending over the extrados of the arch and a portion of both piers. Deformations of the extrados and the intrados of the arch were measured respectively with strain gages and electric telemeters.

Some of the results obtained are:

1. The generation of heat incident to the hardening of the concrete raised the temperature of the thicker portions of the arch barrel to a maximum



of more than 140° F. within a period of 25 hours after pouring.

2. The maximum and minimum average temperatures of the arch barrel resulting from seasonal changes in temperature were respectively 85° F. and 24° F.

3. The coefficient of thermal expansion of the arch barrel was found to be approximately 0.0000065 per °F.

4. The deflections of the crown caused by changes of temperature were about 13 percent less after construction of the superstructure than before.

5. Shrinkage and flow during a period of 2 years following the construction of the arch barrel had approximately the same effect on the deflection of the arch as a drop of 27° F. in the temperature of the concrete.

The complete report of this work will be published as Research Paper No. 609 in the November number of the Bureau of Standards Journal of Research.

#### WEAR OF FLOORS

The Bureau receives many questions from architects and builders as to why some kinds of floors wear out sooner than others and why floors surfaced with a certain kind of marble wear faster than if another marble had been used. The number of these inquiries seemed to warrant an investigation of the subject, since the desired information was not available. To carry out this investigation it was necessary to devise and build testing equipment and to find how well it met the requirements. In technical language, it was necessary to determine if a sufficient degree of correlation existed between the laboratory tests and actual wear values to enable one to predict service values from laboratory tests. Consequently, measurements were made of the rate of wear under actual service conditions and these were compared with test values for the same materials obtained with the apparatus.

A stairway was surfaced with a large number of materials which were carefully measured before being put in place. After a period of use the materials were removed and measurements made to find out how much wear had occurred. The same materials were next tested on the testing apparatus for comparison and the amount of wear measured. It was found that results of the two tests agreed fairly well, but not as well as

desired. Then a series of experiments was made on the apparatus which resulted in changes in mechanism until it gave results that would correlate with service wear to a satisfactory degree.

With the testing apparatus in satisfactory form, tests were made on practically all of the important marbles, limestones, sandstones, slates, etc., produced in the United States for flooring purposes. A considerable number of imported materials were tested also. The information obtained is being published as Research Paper No. 612 in the November number of the Bureau of Standards Journal of Research. It should result in more intelligent selections of materials for floor surfaces.

#### STRUCTURAL CONDITIONS AS THEY AFFECT THE WORK OF A FIRE DEPARTMENT

In a district made up of closely spaced buildings, the predominating type of construction has an important bearing on the possibility of conflagration and the cost and methods of fire extinguishment.

From the standpoint of fire hazard, building construction falls into the three general groups: Interior and exterior wood framing; interior wood framing with incombustible exterior bearing walls; and fire resistive construction. Buildings in the first group offer the maximum opportunity for fires to originate, and the construction is of but little value as a retardant. Exterior masonry walls afford some protection to adjacent buildings when the interior burns, but fires may spread to the proportions of a conflagration in an area covered with such buildings. When fire-resistive buildings burn, each story or fire division burns independently of the others, and this limits the volume of flame and hot gases. With floor and roof construction remaining in place, the only channel for escape of flames, hot gases, and glowing embers will be the wall openings, thus decreasing the hazard to adjacent construction.

Before the advent of modern fire-resistive construction any city was subject to conflagration, particularly with the inadequate means of fire extinguishment then available. The more general use of buildings so constructed that no collapse in fires occurs, even where combustible contents and trim are entirely consumed, has already increased the fire safety of the

high-value districts of our larger cities.

The type of building construction also has an important bearing on the safety to life of occupants and to firemen in extinguishing fire. Irrespective of type of construction, buildings can be made reasonably safe by the provision of adequate exit ways, provided the occupants are awake, able-bodied, and not confined. The largest loss of life in burning buildings occurs in residential and institutional occupancies, and here the type of building construction is more important.

Because of radiated heat, hot-air currents, and flying brands, a fire in a wood-frame building is relatively the most difficult to extinguish. Exterior masonry walls afford some protection, but are very unstable after the interior has collapsed. Unless pulled inward by this collapse they tend to fall outward on account of the expansion of the inner heated surface. Properly constructed fire-resistive buildings can be entered at any stage of the fire, where other conditions permit, without danger from collapses of major structural parts.

#### FIRE-HAZARD TESTS WITH CIGARETTES

Tests have been conducted at the Bureau to determine the fire hazard of discarded lighted cigarettes. The efficacy of certain modifications, such as slow-burning paper and the application of tips over one end was also investigated. In making this study, the burning cigarettes were placed on representative specimens of grass and forest floor materials.

Untipped cigarettes that continue to burn after being lighted, may cause fires when discarded, although when placed on grass and forest floor materials, a draft was found necessary to produce flaming ignition. As determined at the level of the exposed material placed with its surface in an inclined position and with the air current impinging thereon at an angle of 45°, the range in air velocity most favorable for ignition was from 3 to 4 miles per hour. With the surface of the materials in a horizontal position and the speed of horizontal air currents measured a few inches above the materials, the range in which the highest percentage of ignitions occurred with most of the materials was from 6 to 7½ miles per hour. The air speed at the surface of the ex-

posed materials would be expected to be considerably lower.

Under the conditions of the test, with the most favorable drafts and with relative humidities in the range 25 to 50 percent, fires were caused on the average by 9 out of 10 lighted half-length untipped fast-burning cigarettes discarded on grass, forest litter, or duff. The percentage of cases resulting in fires increased somewhat with decrease in relative humidity.

The fire hazard of the slow-burning type of cigarette was found to be much lower than for the fast-burning type. In the former the glow will not progress appreciably after the cigarette is discarded while the latter will continue to glow until fully consumed.

The fire hazard of discarded lighted cigarettes can be decreased by applying tips of cigarette paper. In tests with half-length fast-burning cigarettes having tips 1 inch long of paper similar to that used on this type of cigarette, 4 fires occurred on the average for every 10 trials. With tips of the same length made of the paper used on slow-burning cigarettes, the occurrence of fire in the exposed materials was reduced to 1 out of 4 trials.

The placing of tips on cigarettes is practical from the manufacturing standpoint, and, as made of cigarette paper, they should not be objectionable to the user.

#### PRESERVATION OF RECORDS IN LIBRARIES

Because of lack of funds, the Bureau has suspended, temporarily it is hoped, its studies to find the most favorable conditions for the preservation of important records in libraries. For the past 4 years, the various rather intangible problems confronting librarians in their attempt to save valuable publications from early decay have been studied systematically. Surveys of the conditions surrounding stored material in public libraries indicated that light, adverse temperature, and humidity conditions, acidic pollution of the air, and poor paper, were all taking their toll. Laboratory studies of the effect of light showed that it has a more intensive effect than was commonly realized, that even high-grade book and writing papers may be rapidly weakened by its action, and that this effect may occur without visible evidence of it. Careful control of temperature, and particularly humidity, was found necessary

to prevent dampness which promotes mold, or excessive dryness which makes book materials brittle. In both laboratory exposures of paper to air containing sulphur dioxide, and studies of its effect under normal library conditions, this product of fuel combustion was found to be a most potent source of deterioration. However, it was proved that this danger could be eliminated effectively and inexpensively by washing the air with an alkaline solution. Tests of old newspapers and book papers revealed the deteriorative effects of crude fibers, such as ground wood which for a time was used more or less for all classes of publications. A partially completed study of the protection of records printed on impermanent paper indicated that a covering of Japanese tissue paper or transparent cellulose acetate sheeting might be suitable. Additional work should be done on this problem, and on the equally interesting possibility of preventing or retarding decay of papers by the incorporation of protective materials in them. Of various materials proposed for the reproduction of records, permanent photostat paper appeared to be the most suitable.

This series of investigations was made with the assistance of a fund granted for the purpose by the Carnegie Foundation to the National Research Council.

#### WRITING INK FOR PERMANENT RECORDS

As the result of many experiments, the Bureau has found a writing ink which apparently will not deteriorate paper. After inking, papers were subjected to accelerated aging by applying heat. When heated, the ordinary acid type of writing ink caused rapid embrittlement of the papers, in some cases the folding endurance being decreased 50 percent. The type of ink believed to be satisfactory is alkaline; ammonia replaces the acid of the usual type of ink. There was practically no embrittlement of papers inked with this preparation when they were subjected to the heat test.

#### AMERICAN STANDARD FOR GAGE BLANKS

On October 30 the American Standards Association officially approved as American Standard B47-1933, the commercial standard for gage blanks, CS8-33, as drafted by the American

Gage Design Committee. This constitutes the first revision of the commercial standard which has been in effect since 1930, extends the range of sizes, and includes certain types of gage blanks not previously covered such as adjustable snap gages, adjustable length gages, and combination ring and snap gages.

The project constitutes an outstanding example of voluntary self government in industry, whereby standards are voluntarily drafted and adopted jointly by producers and consumers as a basis for better understanding and fairer competition in the production and purchase of the commodity in question. This is made possible without Government dictation or domination, it being the function of the Bureau to act as a coordinator in the work and to record the standards finally accepted by the industry.

This standard will become effective for new production on January 1, 1934, and for clearance of existing stocks January 1, 1935.

#### SIMPLIFICATION OF COPPER WIRE NAILS

Simplified Practice Recommendation R150-33, Copper Wire Nails, has been accorded the required degree of written approval by the industry and will become effective December 1, 1933. This recommendation covers the length and gage of common copper wire nails with flat heads and copper wire slating nails. It represents a substantial reduction in the varieties heretofore listed for regular stock purposes.

#### SIMPLIFIED PRACTICE RECOMMENDATION FOR TURNBUCKLES REAFFIRMED

Simplified Practice Recommendation R71-28, covering turnbuckles, has been reaffirmed, without change, by the standing committee of the industry. This recommendation covers the diameter and the opening (in inches) of turnbuckles with and without stubs, and of turnbuckles with hook, eye, and jaw ends. This program, as originally made effective in 1928, recommended a reduction in the number of stock sizes of turnbuckles from 248 to 115.

#### REVISED SIMPLIFIED PRACTICE RECOMMENDATION FOR INDUSTRIAL TRUCK TIRES

A proposed revision of Simplified Practice Recommendation R103-29,

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Industrial Truck Tires, has just been mailed to all interests in the industry for their consideration and written approval by the division of simplified practice of the Bureau.

The revised recommendation, which was drafted by the industry's standing committee, reduces the 30 sizes held as standard in the 1929 program to 19. Four new sizes have been added, making a total of 23 sizes. This new program also covers sizes of tires for trailers.

The revised schedule will become effective 1 month after the announcement by the Department of Commerce that the required degree of support has been received and will then be promulgated as Simplified Practice Recommendation R103-33, Industrial Truck and Trailer Solid Tires.

**NEW AND REVISED PUBLICATIONS  
ISSUED DURING OCTOBER 1933**

**Journal of Research<sup>1</sup>**

Bureau of Standards Journal of Research, vol. 11, no. 4, October 1933 (RP Nos. 600 to 608, inclusive). Price 25 cents. Obtainable by subscription.

Bureau of Standards Journal of Research, title page and contents to vol. 10, January to June 1933 (RP Nos. 512 to 572, inclusive). Free on application to the Bureau of Standards.

**Research Papers<sup>1</sup>**

(Reprints from July, August, and September 1933 Bureau of Standards Journal of Research)

RP574. A study of some factors influencing the strength and stability of experimental papers made from two different sulphite pulps; R. H. Rasch, M. B. Shaw, and G. W. Bickling. Price 5 cents.

RP575. Permissible curvature of prism surfaces and inaccuracy of collimation in precise minimum-deviation refractometry; L. W. Tilton. Price 5 cents.

RP579. Note on an improved chain-packed distilling column; S. T. Schickelanz. Price 5 cents.

RP582. Continuous measurements of the virtual heights of the ionosphere; T. R. Gilliland. Price 5 cents.

RP583. The effects of atmospheric moisture on the physical properties of vegetable and chrome tanned calf leathers; W. D. Evans and C. L. Critchfield. Price 5 cents.

RP584. The activity coefficients of hydroxyl ion in solutions of calcium hydroxide at 30° C.; E. P. Flint and L. S. Wells. Price 5 cents.

RP585. Effect of temperature and frequency on the dielectric constant, power factor, and conductivity of compounds of purified rubber and sulphur; A. H. Scott, A. T. McPherson, and H. L. Curtis. Price 5 cents.

RP586. The standard-cell comparator, a specialized potentiometer; H. B. Brooks. Price 5 cents.

RP587. The optical properties, densities, and solubilities of the normal formates of some metals of group II of the periodic system; F. W. Ashton, D. F. Houston, and C. P. Saylor. Price 5 cents.

RP588. Effect of glass containers on the electromotive force of Weston normal cells; G. W. Vinal and M. L. Howard. Price 5 cents.

RP589. Preliminary list of terms for the arc spectrum of tantalum; C. C. Kiess and H. K. Kiess. Price 5 cents.

RP590. Thermal expansion of columbium; P. Hidnert and H. S. Krider. Price 5 cents.

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Reference No. VI-6/INH-655-C. Report on current hydraulic laboratory research in the United States, vol. 1, no. 3, October 1, 1933.

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